ESP Reading: Some Implications in the Design of Materials

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Perhaps the most important ability that a non-English-speaking student of science needs is reading. Such an ability is a crucial tool that aids the learning process, as without it the student cannot deal with the enormous bulk of literature he has to read during his period of study in an English-medium faculty. However, adequate ESP materials that can be used to develop this ability are sometimes not commercially available. Thus, teachers are confronted with the task of preparing their own materials to meet their students' needs.

Developing an ESP reading course for non-English-speaking science students is not easy. Four main problems face the materials developer. These are:

1. deciding on the purpose of the reading in order to determine the level of reading difficulty required by the target group;

2. deciding on the cognitive level(s) of comprehension;

3. selecting texts with the right level of difficulty for both students and teachers;

4. deciding on the appropriate length of the texts.

This article suggests some possible lines of approach based on the experience of teaching reading to science students at Kuwait University, where English is the medium of instruction in the faculties of science, engineering, and medicine. The students are native speakers of Arabic.

The Purpose for and Types of Reading

Three reading skills (or types of reading) recognized as essential by most language instructors are: scanning, skimming, and intensive reading.

Scanning. Scanning is a type of reading that involves finding a particular piece of information located in material that is otherwise of no interest to the reader. Knowing how a text is organized helps a student locate information quickly. Since science textbooks have an index at the end, knowing how to use this index helps students find information easily.

Skimming. Skimming is reading rapidly through a text to get a general idea about the subject. A science student can look quickly at the headings, subheadings, or bold-type words that mark the introduction of new concepts.

It is important to point out that skimming a science text is not the same as skimming any other text. Science books have a different layout and follow certain techniques to make reading at all levels easier. For instance, most science textbooks use headings and subheadings to indicate main ideas and subpoints. They also use numbering systems consistent with these divisions. For example, the heading may be "Bonding between Atoms," which is number 10. This heading is then divided into 10.1 molecular acids, 10.2 macro-molecular solids, 10.3 metallic solids, 10.4 ionic solids (Lewis and Waller 1983).

Studying the layout and organization of a science textbook aids comprehension. At the skimming level this organization enables the students to see the whole as well as the parts. Skimming quickly through a chapter, for instance, does not necessarily mean that a student has to read the chapter quickly to look for topic sentences to find the main points. By studying the organization of the text and by looking for the headings of sections, for boxed information, and for points written in a different color, the student can get a clear idea of the main points the text deals with. Looking at the end of a chapter for rules, conclusions, or summaries also aids reading at the skimming level.

Although science textbooks vary in their layout, they are generally organized quite systematically. For example, when a concept is introduced for the first time, it is written in italics, in capital letters, or in bold-type letters. Examples are often written in a different color. Theories and definitions, on the other hand, are usually written in boxes. Some textbooks have the main points written in the right-hand margin.

To sum up, skimming a science text can be made easier if students are made aware of the general organization, the layout, and the details that science textbooks adopt in order to facilitate reading.

Here is a list of points that students can be exposed to in order to facilitate skimming:

1. Studying the organization of the textbook as a whole by looking at the table of contents.

2. Studying the organization of each chapter and the layout of information by identifying the method(s) the author adopts in presenting ideas.

3. Studying the use of color in a textbook.

4. Looking for boxed information.

5. Studying the use of capitals and slanting and bold-type letters.

After reading at the skimming level, students can be expected to generate an organizational outline that shows the main points of a text.

Intensive Reading. Intensive reading is better utilized if preceded by skim-reading. Skimming a text introduces the student to the whole. In intensive reading, the emphasis is on details that support the main points picked out at the skimming level. Since scientific writing is characterized by conciseness, and because the concepts are related and sometimes dependent on

each other, it can be difficult to read, understand, and relate the ideas in a scientific text. Therefore, understanding how language is utilized to present thought is essential. At this level, knowledge of the types of writing and the methods of development used in a text is vital. Knowing that what s/he is reading is a physical description, for example, helps the student relate and remember information. Knowledge of the methods of development also helps. For example, cause-and-effect relations, exemplification, definitions, comparisons, and the connectors associated with some of them can aid comprehension and play a retentional role, which aids learning.

Not only is intensive reading a must for science students, so also at times is slow reading. Science textbooks are usually heavily illustrated, and sometimes illustrations, which are visual forms of communication, replace verbal communication and need to be carefully "read" and comprehended. Thus, caution is needed when attempting speed-reading, which is possible within limits dictated by the subject matter and the way it is presented.

The Cognitive Levels of Comprehension

Another problem for a materials designer preparing reading materials is deciding on the different levels of comprehension to aim at. Unfortunately, this aspect is much neglected not only in teaching English but in other disciplines (Terenzini et al. 1984; Rida 1975). These levels of comprehension are usually determined by the kinds of questions asked, and by the type of information these questions elicit and the type of thought processes they stimulate (Kissock and Iyortsuum 1982).

Unfortunately, reading comprehension, especially in the ESP field, is too often kept at the low level of recalling information learned or of simply locating information explicitly stated in a text. This is partly due to the fact that the language teacher finds the scientific content difficult to tackle in depth. Also, in an ESP course the main emphasis is on language use, language functions, and terminology; thus, content is kept at a low level so as not to constitute an obstacle that interferes with language teaching. In addition, comprehension questions are manipulated to elicit certain grammatical structures or language functions. The question is: Is this really reading comprehension?

When designing a reading course, it is extremely important to strike a balance between content and language. Questions asked about the content must vary in their cognitive level to allow for intellectual involvement on the part of the student.

Bloom's taxonomy in the cognitive domain can be used to determine which levels to aim at. The taxonomy includes knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom 1956). The taxonomy is hierarchical. It is not possible to answer higher-level questions before being able to answer questions at the lower level. It is the teacher's responsibility to determine the levels of comprehension he aims at, and to prepare questions that elicit certain thought processes consistent with these levels.

The table on the next page shows some types of questions asked in science textbooks, along with the language functions and cognitive levels associated with them. This table can be used as a guide when preparing reading materials. Such materials can be used at the remedial, intermediate, and advanced levels. By following the cognitive approach, which calls for spiral curricula, it is possible to expose students to the same material at different levels (Good and Brophy 1980).

Type of Text and Level of Difficulty

A recent trend in language teaching and learning has been the growing concern with authentic texts (Lynch 1982). Authentic texts selected from science textbooks lend themselves perfectly to the previously discussed points of reading and comprehension levels. Such texts, however, should have the right level of difficulty. In other words, content should not be low-level. Easy content is demotivating to college students. A chapter or a section from an introductory college textbook on chemistry, physics, biology, computers, or mathematics is adequate. The criteria for selecting the topics should be the student's interest and needs (Cooper 1980).

It is important to indicate here that vocabulary, which constitutes a sizable and important part of any reading course, also plays an important role in selecting the topics. The vocabulary needs of a group should be met in a reading course.

Length of Texts

The length of a text depends on the subject. Any reading text selected must deal with a topic fully and comprehensively. A section that deals with the "digestive system," for example, is adequate. A chapter that deals with "matter" is also suitable. This kind of text reflects all the characteristics of a typical scientific text. It enables the reader to see the whole as well as the parts, and lends itself to the three types of reading: scanning, skimming, and intensive reading.

More importantly, such a text reflects scientific logic and therefore can be utilized fully when it comes to writing questions at different cognitive levels.

To summarize the previous discussion, an outline of a reading course that meets the needs of science students at Kuwait University would be as follows:

I. Levels or types:
  A. reading
    1. scanning
    2. skimming
    3. intensive reading

  B. cognitive
    1. knowledge
    2. comprehension
    3. application

4. analysis
5. synthesis
6. evaluation

II. Texts:
A. topics
1. biology
2. chemistry
3. physics
4. mathematics
5. computers

B. length and source
complete sections or chapters from college textbooks

Conclusion

I have tried to shed some light on major problems a materials developer encounters when preparing a reading-comprehension course for non-English-speaking students of science. I have also outlined a plan that pinpoints several important aspects to be considered before materials for a reading course are attempted. I have not dealt with details of the types of exercises for developing certain micro-skills, which are outside the scope of this article.

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